CHAPTER 1

INTRODUCTION

1.1 Background Study

Propolis or bee glue is a natural resinous mixture produced by honey bees from substances collected from parts of plants, buds and exudates (Wagh, 2013). Bees use this glue to repair their hives by sticking any openings or cracks because of its waxy characteristic and mechanical properties. Propolis also acts as a shielding barrier against foreign intruders such as snakes and lizards. More than 300 constituents have been identified in different propolis samples (Bankova et al., 2000). Flavonoids, aromatic acids, diterpenic acids and phenolic compounds appear to be the principal components responsible for the biological activities of propolis samples (Silici and Kutluca, 2005). Propolis has various biological activities such as antibacterial (Grange and Davey, 1990), antiviral, anti-inflammatory and anti-cancer properties (Kumazawa, Hamasaka and Nakayama, 2003). Hence, it is believed that adding propolis in food and beverages can develop health and counteract diseases like inflammation and diabetes.

Propolis is a lipophilic in nature, hard and brittle material and it becomes soft, pliable, gummy and very sticky when heated. It possesses a characteristic and pleasant aromatic smell and varies in colour from yellow, green, red and dark brown depending on its source and age (Wagh, 2013).

Chemical compounds that are contained in propolis are polyphenols, terpenoids, steroids, and amino acids. The composition of propolis depends on the vegetation at the

site of collection (Kumazawa, Hamasaka and Nakayama, 2003). For example, propolis from Asia contains many kinds of flavonoids and phenolic acid esters meanwhile the main constituents in Brazilian propolis are terpenoids and prenylated derivatives of pcoumaric acids. Based on the examples, biological activities of propolis from different regions are also distinctive because of chemical configuration variances. At 25°C to 45°C, propolis is in the form of soft and sticky. On the other hand, in frozen condition, it's hard and brittle. Above 45°C, it will become more sticky and gummy. Propolis will become a liquid at 60°C to 70°C, but for some samples the melting point may be as high as 100°C (Wagh, 2013). Propolis cannot be used directly because of its complex structure. Hence, it has to be extracted by using water, alcohol, oil, ether or acetone. Many of the bactericidal components are soluble in water or alcohol which should remove the inert material and preserve the desired compounds (Wagh, 2013).

Propolis is a natural remedy which is beneficial in many fields. It is used in medicine for self-treatment of various diseases and in cosmetic production. Recently, propolis is used to formulate for cold and dermatological preparations useful in wound healing, treatment of burns, acne and neurodermatitis. Propolis is also used in mouthwashes and toothpastes to prevent caries (Sforcin and Bankova, 2011). Due to its antibacterial, antimicrobial, antiviral and antioxidant properties, propolis is widely used in human and veterinary medicine and pharmacology (Ehsani et al., 2013). Ethanolic extracts of propolis samples showed a high antibacterial activity against Gram-positive cocci (*Staphylococcus aureus*), but had a weak activity against Gram-negative bacteria (*Escherichia coli* and *Pseudomonas aeruginosa*) and yeast (*Candida albicans*) (Silici and Kutluca, 2005).

1.2 Problem Statement

While conducting this research, the main problem faced is stickiness of raw propolis. The stickiness and gluey condition are due to the presence of Balsam in propolis. Thus, stickiness problem of raw propolis causes the propolis difficult to be processed into capsule. Adding on, physical instability is found to cause a problem in the manufacturing of the propolis capsule (Swarbrick, 1996). Packing the propolis powder in capsules was better choice than tableting because capsules are stable and have an accurate dosing (Qureshi, 2007). Besides that, the process of encapsulation of

the propolis is also found to be hard as the propolis does not have good flowability properties. Due to this most capsules are not filled completely. This problem tends to affect the quality of the propolis capsules that is being manufactured.

1.3 Research Objectives

The group objective in conducting this project is to develop propolis powder for encapsulation via freeze drying method.

The individual objectives of conducting this research are as follow:

i. To extract propolis by water and ethanol extraction method.
ii. To determine components of propolis extract and evaluate its antioxidant activity.

1.4 Scope of Study

The propolis was collected from a hive of *Trigona Thoracica* bee species. In this study, propolis is extracted by using water and ethanol extraction method. Water extraction method was opted because this extraction method is time saving in producing propolis extract compared to ethanol extraction. By incubating the propolis in water and ethanol for one day and seven days respectively, liquid extractant of propolis was obtained. This research had focused on determining flavonoid and polyphenol components and antioxidant activity of propolis. These major propolis properties were determined by using UV Vis Spectrophotometer to find out whether EEP or WEP has higher amount of components. In addition, the antioxidant activity of propolis is tested with free radical scavenging testing utilizing 1,1-diphenyl-2-picrylhydracyl (DPPH) chemical.